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SILVICULTURAL EFFECTIVENESS OF REGENERATION FELLING IN PINE FORESTS OF VERKHNEBEREZINSKIY GEOBOTANICAL ZONE

As a result of regeneration cuttings in Pinetum pleuroziosum formed pure and mixed stands in composition of natural origin (10Pine and 8Pine2Birch). Due to the presence in the composition of deciduous species are very important to timely silvicultural treatments for the successful formation of plantations with the target species composition. On the part of the mineralized areas considered significant amount of pine undergrowth, so during regeneration cutting with harvesting and removal of logs from logging sites for the successful renewal is required soil mineralization.

Introduction. In modern silviculture sufficient deal of interest is given to plants' development due to preserving new growth of special woody species of preliminary origin and its number under the canopy of ripening and mature forest stand, nature of distribution on area and life condition define kinds of forest cuttings and even help to establish their possible volumes.

There is an interest to natural renewal first of all because it has a number of considerable advantages to artificial plant creation. Self-seeding from the seeds of maternal trees and grown in natural environment turns out to be more viable than planting stock and seedlings. In future longer-lived with more valuable wood planting of natural origin is formed from self-seeding. Intensity of natural seed regeneration can be intensified and accelerated by the so-called assistance-measures. These measures are applicable under canopy for activation of preliminary regeneration and also during gradual cuttings for increase of relevant regeneration, on clean felling – for further regeneration. Acceleration and increase of efficiency regeneration will help to intensify cuttings, prevent species replacement and reduce total regeneration period that can be expanded for a long time (to 20 and more years), that increases cutting period during this time.

Firstly, issue on successful natural regeneration is in forests of the first group and particularly acute – in those protection categories where felling for primary use is banned and the so-called regeneration felling is fixed.

Main part. During creation of trial areas generally accepted methodology in silviculture and dendrometry is used. Description of understory trees and underwood was carried out in two transects as large as 1×50 m. Understory trees were measured according to the species, vital condition and height groups (on 50 cm). Density was established for underwood and average height of underwood story was indicated.

It is known that RUE “Belgosles” at each ordinary standard forest organization is responsible for planning of silvicultural operations including forest felling. And if only 10–20 years ago forestry-based

establishments of Belarus carried out regeneration felling on small areas but now their number annually increase that is naturally determined and provided by increase of percentage of forest land of the country, forest area of the first group including the category of protection where felling for primary use is not carried out due to the forest legislation. In this connection, it is necessary to carry out further improvement of ecologically oriented system of forest cultivation where not only economical but also ecological aspects of reproduction of pine forests formation predominant in Belarus including regeneration felling would be sufficiently taken into account.

Study of peculiarities and regeneration felling results can be a base for development of recommendations on reproduction of pine forests of relevant protection categories of the first group which should include a complex of organizational and forestry-based measures meeting the requirements of modern level of knowledge about nature and forest cultivation and criteria of stable multipurpose forest exploitation and forest certification.

In accordance with the effective technical code of common practice TCP 143-2008 (02080), regeneration felling is appointed and carried out in mature and overmature stands in forests where felling for primary use is banned and natural or artificial regeneration of planting are provided. The main purposes of these cuttings are prevention of natural decay of planting due to their aging, supply of stability of forested lands, preservation and increasing of special functions of planting by cultivation mainly mixed in terms of age, mixed in terms of composition and shape-complex, preferably family-origin planting.

The main purpose of regeneration felling is cultivation of long-lived and resistant planting, constantly and efficiently fulfilling goal functions: water-protective, protective, sanitary and hygienic and others and also preserving biological diversity. During the cuttings, conditions for natural regeneration of wood species, meeting to the fullest extent possible the requirements of goal functions and growth conditions are created [1].

Peculiarities of planting formation as a result of regeneration felling have been studied on trial areas bedded out in moss pine forests growing in the 31-st division of 121-st section and in the 9-th division of 125-th section of Tumilovich forest district of Hlybokaye experimental leskhoz.

Planting under investigation consisted of pure medium stocked mature forest stand of the II class bonitet, formed under the conditions A₂. Composition of the young growth till cuttings – 10P and 9P1B, average height – 0.3 and 0.5 m, amount – 2500 and 500 pcs./ha correspondingly.

Trees felling, branch cutting and cutting into sections have been carried out by petrol saw, skidding – by forwarder Amkodor-2661. First regeneration cuttings took place in 2009 by means of equal thinning of forest stand, with the intensity of 44 and 73% correspondently. Clearing the felling site has been carried out simultaneously with timber harvesting by means of felling waste burning in piles. After first cuttings at the sites mineralization has been carried out by plowed furrows. Recording of the young growth was carried out in June 2012 (Table 1). According to the table 1 as a result of regeneration felling by means of equal thinning of forest stand on trial area 1 (TA 1) pine young growth has been formed at the amount of 11 800 pcs/ha with average height of about 0.9 m. Examination of the young growth sites shows that recorded samples grow in plowed furrows as well as in non-exposed mineral soil. Healthy young growth predominates (91.5%), as for depressed and damaged, there is only 8.5%. Understory trees consist of alder buckthorn and ground cedar at the amount of 1200 pcs/ha. The composition of understory trees – 8 Aldb2Grced. Average height of understory trees is 0.8 m, density – 0.03.

As a result of regeneration felling with intensity of the first felling of 73% on TA 2 a young growth with mixed composition was formed

(8P2B) at the amount of 4400 pcs./ha, which also grows in furrows as well as in non-exposed mineral soil. Birch trees consist of healthy trees only. As for young trees of pine, 88.8% of their amount refers to the category “healthy”, 5.6% – to the category «depressed» and 5.6% – to the category «damaged» (mainly by elk). Average height of young pine trees is 1.0 m, birch – 1.3 m. Norway spruce, alder buckthorn, ground cedar and European mountain ash (density 2800 pcs./ha) occur in understory. The composition of the understory – 7Aldbuck2S1Gr+MounAsh, average height – 1,5 m, density – 0,12.

In table 2 there are species diversity of forest live cover after first felling.

Species diversity of lower layers of planting on TA 1 has 21 species. Plant cover on grass-subshrub story makes 40.6%, and on moss-lichen – 28.4%. Species composition of forest live cover on TA 2 is characterized by 15 species. Plant cover on grass-subshrub story makes 24.2%, and on moss-lichen – 17.0%. Forest live cover consists of light-loving species of exposed sites and cut-over lands. Moss-lichen story consists of green mosses as a rule.

Conclusion. From the received results it is obvious that after regeneration felling in pine moss forests pure and mixed planting of natural origin is formed, where Scotch pine predominates. In connection with the presence of soft-leaf-bearing species it is very important timely carry out silvicultural tending for successful forming of planting with unregulated species composition.

Composition of young trees after first felling on TA 1 – 10P, on TA 2 – 8P2B. Therefore, on the above mentioned areas it is necessary to have a skillful silviculturally-based planning of all logistical elements during final felling for maximal preservation of understory of desired species which is plenty enough at present for forming new planting of natural origin.

Table 1

Description of young growth on trial areas (TA)

TA Forest type	Tree types	Height group, m	Number of samples on conditions categories, pcs./ha			Total, pcs./ha
			Healthy	Depressed	Damaged	
1 P. mo.	Pine	0.11– 0.50	1 200	600	–	1 800
		0.51–1.50	9 200	–	400	9 600
		1.51 and higher	400	–	–	400
		Total	10 800	600	400	11 800
2 P. mo.	Pine	0.11– 0.50	600	200	–	800
		0.51–1.50	2 000	–	200	2 200
		1.51 and higher	600	–	–	600
		Total	3 200	200	200	3 600
	Birch	0.11– 0.50	–	–	–	–
		0.51–1.50	400	–	–	400
		1.51 and higher	200	–	–	200
		Total	600	–	–	600

Table 2

Species diversity of forest live cover on trial areas (TA)

Species name	TA 1				TA 2			
	Occurrence, %	Plant cover, %	Abundance, number	Viability, number	Occurrence, %	Plant cover, %	Abundance, number	Viability, number
Grass-subshrub story								
<i>Calamagrostis epigeios</i> (L.) Roth.	20	3,6	2	3a	16	4,2	2	3a
<i>Calluna vulgaris</i> (L.) Hill.	16	2,6	2	3a	24	6,0	4	3a
<i>Chamaenerion angustifolium</i> (L.) Scop.	12	1,2	2	3a	–	–	–	–
<i>Chimaphila umbellata</i> (L.) W. Barton.	4	<1	1	3б	–	–	–	–
<i>Convallaria majalis</i> L.	–	–	–	–	8	<1	1	3a
<i>Festuca ovina</i> L.	24	7.2	4	3б	28	4.4	3	3a
<i>Hieracium pilosella</i> L.	20	1.4	2	3б	8	<1	1	3b
<i>Hieracium sylvularum</i> Jord. ex Boreau	20	2.2	2	3б	12	<1	1	3b
<i>Hypericum perforatum</i> L.	8	<1	1	3б	4	<1	1	3b
<i>Lycopodium clavatum</i> (L.) Beauv. ex Mirbel	4	<1	1	3б	–	–	–	–
<i>Lycopodium complanatum</i> L.	8	<1	1	3б	8	<1	1	3b
<i>Polygonatum officinale</i> All.	8	<1	1	3б	8	<1	1	3b
<i>Rumex acetosella</i> L.	16	1.6	2	3a	–	–	–	–
<i>Solidago virgaurea</i> L.	24	2.2	3	3a	12	<1	1	3b
<i>Thymus serpyllum</i> L.	12	2.8	2	3a	12	1.6	2	3b
<i>Vaccinium myrtillus</i> L.	8	<1	1	3б	20	3.2	2	3a
<i>Vaccinium vitis-idaea</i> L.	40	12.4	4	3a	–	–	–	–
Moss-lichen story								
<i>Cladonia rangiferina</i> (L.) Weber ex F. H.	12	2.0	2	3a	–	–	–	–
<i>Dicranum polysetum</i> Hedw.	40	12.8	4	3a	40	3.8	3	3a
<i>Hylocomium splendens</i> (Hedw.) Schimp.	12	<1	1	3б	20	3.2	2	3a
<i>Pleurozium schreberi</i> (Brid.) Mitt.	60	11.6	5	3a	40	10.0	4	3b
<i>Polytrichum juniperinum</i> Hedw.	12	1.2	2	3a	–	–	–	–

It should be mentioned that on mineralized part of the areas a considerable number of young pines have been recorded, therefore, during regeneration felling with harvesting and removal of assortment from woodcutting area; for successful regeneration mineralization of soil is necessary.

Species diversity of life forest cover is not varied and mainly includes light-loving species of open sites and cut-over areas and it is practically

the same as the areas with equally-gradual felling for primary use.

References

1. Рекомендации по проведению рубок обновления и переформирования насаждений различного целевого назначения Республики Беларусь. Минск: Минлесхоз, 1999. 22 с.

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